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IMPLEMENTATION COMPLETION REPORT

KOREA

SCIENCE EDUCATION AND LIBRARIES COMPUTERIZATION PROJECT

(Loan No. 3468-KO)

May 15, 1998

Education Sector Unit
East Asia and Pacific Regional Office

CURRENCY EQUIVALENTS

Currency Unit	=	Korean Won (W)
At appraisal	=	US$1 = W 730
At completion	=	US$1 = W 1707

WEIGHTS AND MEASURES

Metric System

FISCAL YEAR

January 1 - December 31

ACADEMIC YEAR

March - February

ABBREVIATIONS AND ACRONYMS

BE	Board of Education
CULA	Committee for University Library Automation
EFB	Education Facilities Bureau
ELPD	Education Loan Projects Division
EMD	Equipment Maintenance Division
GHS	General High School
GOK	Government of Korea
GPN	General Procurement Notice
ICB	International Competitive Bidding
ICR	Implementation Completion Report
IFB	Invitation For Bids
KCUE	Korea Council for University Education
KEDI	Korea Educational Development Institute
KIST	Korea Institute of Science and Technology
MOE	Ministry of Education
O&M	Operations and Maintenance
OSROK	Office of Supply, Republic of Korea (name at appraisal)
PCC	Project Coordinating Committee
PCR	Project Completion Report
PPAR	Project Performance Audit Report
R&D	Research and Development
SAROK	Supply Administration, Republic of Korea (name at completion)
SEC	Science Education Center
SNU	Seoul National University
SOE	Statement of Expense
STEB	Science and Technical Education Bureau
TAP	Technology Advancement Project
TRC	Technical Repair Center
UEO	University Education Office
VHS	Vocational High School
VTI	Vocational Training Institute

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PREFACE

This is the Implementation Completion Report (ICR) for the Science Education and Libraries Computerization Project in Korea, for which Loan 3468-KO in the amount of US$50 million equivalent was approved on May 12, 1992, signed on June 19, 1992 and made effective on September 9, 1992.

The loan was closed on schedule on December 31, 1997. Final disbursement took place on May 7, 1998, and a balance of US$787,190.33 was canceled.

The ICR was prepared by Mr. Robert McGough, assisted by Mss. Carol Ball and Omporn Regel. The ICR was reviewed by Mr. Alan Ruby, Manager, EASED and Mr. Sri-Ram Aiyer, Country Director, EACKO. The Borrower's contribution to the ICR is included in the ICR as Annex B.

Preparation of this ICR was begun during the Bank's last supervision/completion mission in September - October, 1997, which visited the Ministry of Finance and Economy, Ministry of Education (MOE), Supply Administration, Republic of Korea (SAROK), Chonnam National University's Library and Natural Science College, Pusan National University's Library and Natural Science College, and the Pusan Institute of Science Education. This information in this report is based on materials in the Project Implementation Index File, Division Files, and submissions from the Borrower dated January 15, 1998 and February 13, 1998 as well as information received during the completion mission. The Borrower contributed to the preparation of the ICR by: (a) providing specific data upon request; and (b) contributing views reflected in their own evaluation of the project's preparation and execution. The Borrower's Evaluation Summary which is included in this ICR as Annex B.

IMPLEMENTATION COMPLETION REPORT
KOREA
SCIENCE EDUCATION AND LIBRARIES COMPUTERIZATION PROJECT
(Loan 3468-KO)

EVALUATION SUMMARY

Objectives

i. The overall objective of the project was to assist in improving the quality of basic science education and to provide a more effective flow of information between university libraries which service teaching and research.

Implementation Experience and Results

ii. Overall implementation was highly satisfactory. The project was closed on schedule with no cost overrun. Counterpart funds for the base costs to cover library database conversion and staff for network support for the implementation of the Library Network Component were somewhat short at the beginning of the project but were adequately provided for during subsequent project years. Counterpart funds for the other two components (Science Education Centers and Undergraduate Science Education) were adequately provided throughout the project years. The actual disbursements were US$49,212,809.67 million or 98.4% of the loan amount. Disbursements conformed to all Bank's procedures including the use of Special Accounts. The project encountered four difficulties during the beginning years of implementation. Two were procurement related due to the complexity of the mainframe computers, the third was the dispute between two ministries over the library network control, and the fourth was budget shortage for funds and staff supporting the library network. These difficulties except the latter affected the disbursements during early years and resulted in a two-years delay of depositing the initial US$4.0 million deposit to the Special Account. Eventually, disbursements were on schedule after the overcoming of the initial difficulties. Effective implementation during later years made the project implementation satisfactory. There was no overdue audit report and all other covenants were in full compliance.

iii. The project was designed to raise the quality of science programs offered in the secondary schools and in the basic science programs in the universities in order to strengthen the quality of science and engineering degrees, and to establish an interlibrary network linking 37 institutions to enhance the access to information of students, faculty and researchers as stated in the SAR (para. 2.4). All of the project objectives were successfully met.

iv. The modernization of laboratories in secondary schools and an improvement in the quality of science education was apparent. The general scientific awareness to the public was accomplished through schools' demonstration and exhibition programs. The

equipment operational hours has substantially increased as well as the number of trainees and hours for experimental and practice training contributing to raising the quality of science education.

v. The establishment of the joint science centers in all national universities was completed and has been widely recognized as successful. The high-cost sophisticated equipment installation and testing in the participating higher education institutions were completed on schedule. The joint usage of specialized equipment and reducing Operations and Maintenance (O&M) costs were considered as a very efficient way of using scarce resources. Research programs have been broadened and related scientific publications have significantly increased.

vi. The national library network was also completed and was operational in more than 40 universities. The network actually linked to all the universities in Korea. The procurement and installation of network hardware and the computer operating system conversion to Unix were successfully completed despite an earlier power struggle between the Seoul National University (SNU) and the Central National Library. The switching over to computerized systems for cataloging, search and research has been functioning well and in full use. The SNU was the managing entity of the library database after an agreement was reached between MOE and the Ministry of Culture. The initial network supporting staff shortage indicated by SNU, was later provided by the Government to support the Library Computerization Component. Computers were considered adequate and Bank staff during the ICR mission was told that there will be an annual equipment budget provided by the Government. There was no training issue because the network's software was user friendly, and no specific training courses were needed.

vii. The procurement process for this project had a longer than usual lead time than other Bank-financed projects in Korea. Due to the complexity of mainframe computer specifications, the Bank required prior review for all mainframe computer procurement for this project. Based on the good track records of the Government's procurement division, the Supply Administration, Republic of Korea (SAROK), prior reviews usually were not required for other Bank-financed projects in Korea.

viii. Another procurement delay was due to the decision by SAROK to use the longer procurement procedure that involved two-stage bidding for the first mainframe computer procurement for the SNU. Procurement of mainframe computers was further delayed by one participating university relating to the acceptability and compatibility of a donated mainframe computer by Samsung Company in Kangwon.

ix. The control of the library network between two ministries, Ministry of Culture and Ministry of Education, was a major implementation delay in addition to the approval required by the Ministry of Communications for any communication equipment over the amount of US$300,000. Shortage of staff and computers was corrected during the third year of implementation. Budget allocation was improved under the new budget situation

of the Ministry of Education, which assumed the management responsibility for the library network.

Sustainability

x. All equipment in the science education centers in the secondary schools and in the joint science centers in all national universities was well kept, managed and maintained. Utilization rate of this equipment has been high. The quality of science education has been raised given the proof of high employment rate and increased number of graduate school entrants. There were no issues on management and recurrent costs relating to these centers. Therefore, it is very likely that the centers will be sustained and continue to be operational in the future.

xi. The Government has a clear understanding of the current issues and needs in the library automation system, and sees the benefits of easy access through internet and local area network (LAN) and making the electronic information resources available to students and faculty of all universities and colleges in Korea. The Government has demonstrated its continued support for the project by its inclusion of Won 1,866 million in the 1998 budget for the hardware and software upgrading programs and O&M costs of the library network system. The ICR preparation team was informed by several faculty staff of the participating universities that these costs will be included in the future national budget and will be increased annually to meet the library automation system yearly requirements.

xii. In addition, the increased usage of the library network system by the network community including university students and faculties will act as a backbone for the sustainability of the library network system. It is widely recognized that accessing the rich information resources of the library network system as well as the importance of internet access have been crucial and effective to all university students and faculty. 37 national universities were planned to participate in the project, but 44 national universities were actually included as well as other universities, both public and private. Linking all 184 universities to the library automation system is underway and development and upgrading of that system will be continuous.

Bank Group Performance

xiii. Bank performance was satisfactory in the preparation and appraisal stages of this project. A previous similar Bank-financed project, the Science and Technology Education Project, Ln. 2427-KO, gave a clear direction and understanding of the issues and needs, and therefore, reduced the number of staff weeks required for project design, processing and implementation.

xiv. There was one implementation problem at the beginning of the project namely the exclusion of two eligible categories under the Schedule 6 of the Loan Agreement. The appropriate action was taken and corrections quickly made. The good working relationship

between the Bank and the Borrower was not affected, and therefore there was no adverse effect on the development outcomes of the project.

xv. Bank supervision totaled about 28 staff weeks. This amount of time commitment is relatively low by Bank standards. For the most part, this is due to efficiencies gained from the Bank management's decision to supervise all of the current education projects, in Korea, using single, well-prepared missions (3 to 5 projects during each mission). Supervision work was detailed and cost effective.

Borrower Performance

xvi. Borrower performance during project preparation and appraisal stages was highly satisfactory. There were implementation delays during the first year of the project. These resulted from: (i) using the two-stage bidding process for the mainframe procurement causing a longer than usual lead time; (ii) unresolved issues between two ministries (MOE and MOC) causing budget problems; and (iii) the requirement for additional approval by the Ministry of Communication for the purchase of communications equipment, which was unforeseen by the project preparation team. By the third year all problems were solved and, given the high quality of the MOE staff and efficient procurement support of the national procurement agency, SAROK, implementation was on schedule and completed on time with no budget overrun.

xvii. Counterpart funds were adequate for the Science Education Centers and Undergraduate Science Education Components. During the first year of the project, there was a shortage of counterpart funds for library network support, but this concern was effectively addressed by MOE. The shortage did not affect the project's outcomes.

xviii. Covenants were in full compliance, and there were no overdue audit reports throughout the project years.

Summary of Findings, Future Operations and Key Lessons Learned

xix. Although the project was rated highly satisfactory, it should be noted that this project was not prepared with an appropriate set of monitorable performance indicators. [1/] Fortunately, the ICR preparation questionnaire and GOK's own evaluation summary gave some positive indications on the achievements of project impacts and outcomes.

xx. Science education centers of the secondary schools and joint science centers of all the national universities have raised the quality of the science education and increased

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[1/] The project was prepared at a time when monitorable project indicators were not required as a part of the project design. Also, the project's design is straight forward and much of the expected benefits are obvious and not difficult to declare through subsequent evaluation. These evaluations have determined that the project was highly satisfactory and that it effectively met all of its objectives.

relevance of the rapid changing technology of the workplaces. Graduates from secondary schools were able to find employment or continue to universities/colleges.

xxi. The computerized library network system is currently in full operation at its planned scale. In the future, it will be linked to all universities, private or public, in Korea. The agreed computer operations system, Unix, is working well, and the Korean language software has proven to be both effective and efficient. Through this system, university students and faculty members in Korea have come to better understand the need for information provided by the network. The use of the system has also been a key factor in the notable increase in the number of research programs and scientific publications (during the project years).

xxii. Korea graduated from borrower status in June 1995, however, due to the recent financial crisis in the region, the Government has asked for some structural adjustment loans.

xxiii. There is one key lesson to be learned from this project. Due to the complexity of the computer environment and its fast changing technology, sufficient preparation time should be allowed to assess the long-term compatibility of planned and existing equipment, software and systems in order to prevent unforeseen implementation delays.

IMPLEMENTATION COMPLETION REPORT
KOREA
SCIENCE EDUCATION AND LIBRARIES COMPUTERIZATION PROJECT
(Loan 3468-KO)

PART I: PROJECT IMPLEMENTATION ASSESSMENT

A. PROJECT OBJECTIVES

1. The broad aim of the project was to assist in improving the quality of basic science education and to provide a more effective flow of information between university libraries which service teaching and research. More specifically, the project provided assistance to: (a) raise the quality of science programs offered in the secondary-level science education centers and in undergraduate basic science programs in selected universities to strengthen the quality of science and engineering degrees; and (b) establish a computerized, interlibrary network linking 37 institutions to enhance the access to information of students, faculty and researchers.

Sectoral Development Objectives

2. This project was developed on the basis of the outcomes of a previous project, the Science and Technical Education Project (Ln. 2427-KO). For several years, the Government had sought to raise the quality and quantity of university and college trained scientists and engineers to meet the emerging labor market demands. A key strategy in this effort is the Government's efforts to improve the quality of basic science education in the secondary schools and to raise the scientific awareness of the general public in Korea, thus providing a better supply of potential students to the universities and colleges.

3. As a second part of the project, the government also realizes the importance of sharing information within the universities and the international communities for teaching and research. The globalization of technology is a key factor to the potential success of the industries in Korea. The library automation system is designed to enable the universities to access national and international information to support this effort.

Policy Issues

4. The Korean economy is becoming increasingly reliant on technology information-oriented production. The changing trend in the whole world is also towards knowledge intensive and information-oriented economic societies. In order to maintain and expand its international competitiveness, Korea must find ways to produce sufficient quantities of scientists and engineers to keep abreast of this trend.

5. The Government has a clear understanding of the issues and needs in the scientific fields. It also understands that the production of qualified scientists and engineers is not only a function of the university environment. A steady supply of potential students must be prepared first through high quality basic science education in the secondary schools.

Evaluation of Objectives

6. The Government's objectives for the project must be considered relevant in that they are intended to strengthen the nation's capacity to train scientists and engineers, a critical area of shortage in the labor force of the nation. These efforts are particularly important as technology is the driving force for successful competition with other nations. The project's objectives are also based on the outcomes of the previous project (Ln. 2427-KO).

B. ACHIEVEMENT OF PROJECT OBJECTIVES

7. The project met its overall objectives and its main achievements include the following:

(a) The project successfully modernized the experimental and laboratory equipment for the 15 science education centers serving secondary science education. Raising the quality of science teachers is considered, by MOE, to be one of the most important factors in the strengthening of science education. The purpose of the science education centers is to provide in-service training to science teachers and to develop and distribute science instructional materials for the use within secondary schools. The total "equipment using hours" (for equipment financed by the project only) was as high as 243,948 hours, covering 81% of total experiments defined in the curricula. The operation of the science education centers also has a high rate of project-financed equipment usage, with about 80% of their total capacity hours being used. The scientific awareness of the public was also enhanced through a program whereby the schools provided technology demonstrations and exhibitions.

(b) The establishment of the joint science centers in 18 national universities with colleges of natural science was completed and has been widely recognized as successful. A total of 3,674 pieces of equipment have been procured as scheduled. Research programs have been broadened and related scientific publications have significantly increased. There were about 3,508 research activities that used project-financed equipment, or about 42.1% of the total research activities planned during the project years. Student enrollment has increased by about 4.4% and the number of graduates, by about 5.3%. The number of graduates who obtained employment has also increased by about 18.5%. The most impressive increase is the number of graduates advancing to graduate schools. This increase was about 44.5%.

(c). The national library network was also completed and became operational in 44 universities. Eventually, it is planned that the network will link to all the universities in

Korea. The linking status of the network in Korea, so far, has accomplished the following: (i) libraries - 90%; (ii) campus - 70%; and (iii) internet - 64%. It is expected that the linking process will be completed by the end of 1998.

(d) The procurement and installation of network hardware and the computer operating system conversion to Unix were successfully completed despite earlier delays. The local language software is 100% complete and is operational. The computerized cataloging, search and research systems are also fully operational and are functioning well. The SNU has been designated the managing entity of the library database after an agreement was reached between MOE and the Ministry of Culture. Initial network supporting staff shortages at SNU, were provided for by the Government under the budget of MOE. Computer equipment is now considered adequate for the short to medium term and an annual equipment budget is provided by the Government to support the maintenance and future expansion requirements of the library automation system.

(e). The project scope actually exceeded the original design of the project. The library network was not only linked to the original 44 national universities libraries covered by this project, but was also linked to 2 public universities and 138 private universities.

C. IMPLEMENTATION RECORD AND MAJOR FACTORS AFFECTING THE PROJECT

Implementation Record

8. The overall implementation of the project was satisfactory despite some difficulties during the early project years. The Education Facilities Bureau of MOE had the main responsibility for executing the project. Even though it is an agency that has considerable amount of experience in implementing Bank-financed projects and has the benefit of help from the Government procurement agency, SAROK, there were still delays during the early implementation stage of the project. Much of this was due to the difficult systems design requirements of the project.

9. With the exception of main frame computers, prior review of procurement is not typically required for Bank-financed projects in Korea. This agreement is in recognition of the efficiency and dependability of the GOK's procurement agency, SAROK. The primary causes for the longer than usual lead times for the procurement of the 11 mainframe computers was: (a) the complexity of the mainframe computer specifications; and (b) the requirement for prior review by the Bank.

10. Procurement was also delayed by SAROK's decision to use the two-stage bidding procedures for the first mainframe computer for the SNU. The procurement was inappropriate and was corrected quickly by the Bank for the rest of the mainframe computer procurement. Procurement of the mainframe computers was also delayed somewhat because there was a compatibility issue relating to a donated mainframe computer from the Samsung Company in Kangwon.

11. In addition, during the first year of the project, it became evident that all communication equipment contracts that exceeded the amount of US$300,000 were required to be approved by the Ministry of Communications. This procedure caused some delays as it was not foreseen in the original project implementation plan.

12. There were no time overruns for any project components, and no budget shortage for the Science Education Centers and Undergraduate Science Education Components. The initial budget shortage for the Library Network Component was corrected during the early years of the project. The actual disbursement were US$49,212,809.67 or 98.4% of the loan amount. All of the mainframe computers were procured under the ICB procedures, and as well as 95% of the other equipment procured under the project. Other than the two-stage bidding procurement procedure used for one procurement, there were no deviations from the agreed Loan Agreement there were no other irregularities.

Major Factors Affecting the Project

13. The procurement delays and a two-year disbursement delay during the first part of the project was the only major factors affecting the project. Early recognition of the problems and a strong cooperative working relationship between the Bank and GOK overcame the initial difficulties. They did not significantly affect the overall achievement of project objectives.

Consulting Services

14. The technical oversight of the long-term network development was undertaken by the Committee for University Library Automation (CULA) with terms of reference agreed by the Bank. Their efforts were less than satisfactory during the first two years of the project. Consequently, during the third project year, the responsibility was transferred to the Ministry of Education where the Bureau of Education Information Management was established. This organization's performance was highly satisfactory and it was successful in recovering from the implementation delays suffered during the first two years.

D. PROJECT SUSTAINABILITY

15. The Government understands the importance of science education and has long placed a priority on the development and maintenance of this subsector. It is current Government policy that this subsector will remain a high priority for development in the foreseeable future. The Government's strong commitment has allowed the participating science education centers of the secondary schools and joint science centers in the undergraduate science universities and colleges to grow and to prosper in their respective educational environments. Given the current demand for high-technology skill development, and GOK's willingness to support a wide variety of programs to meet this demand, there is every reason to assume that finances will continue to be provided and

the policies in the subsector will be clearly focused to support the changing needs of the workforce in Korea.

16. The library automation system will be also be sustained, because the Government has a clear understanding of the current issues and needs of the libraries and the role that they must play in the preparation of skilled workers and scientists. Likewise the Government is already impressed with the benefits that are being derived from easy access through internet and local area networks (LAN) and the provision of electronic information resources to students and faculty of all universities and colleges in Korea. The Government has demonstrated its support in the library automation system by financing and appointing a Committee (Bureau of Educational Information Management) located at the Advanced Academic Information Center to establish a comprehensive cataloging system of all the data possessed by all the university libraries in the country.

17. There is already evidence of this commitment. Originally, only 37 national universities were financed under the project. Upon completion, all 44 national universities were included. The library network has also expanded to other universities, both public and private. So far, 118 universities out of the total 184 universities in Korea have been linked to the library network. Linking all 184 universities to the library automation system is underway and further development and upgrading of that system will be continuous.

18. The Government has also included 1,866 million Won for the 1998 budget to continue its contribution towards the hardware and software upgrading programs and O&M costs for the library network. It is understood that these costs will be included in future national budgets and will be increased annually to meet the library automation system's yearly requirements.

19. Given the above mentioned findings, it is reasonable to assume that the project outcomes will be fully sustainable in the future.

E. BANK GROUP PERFORMANCE

20. Staff time spent on preparation and appraisal stages was very low compared with other Bank projects. This project was designed and approved on the basis of the evaluated results of a previous similar project, Ln. 2427-KO, so both the Bank and GOK were well informed and aware of the science education issues and needs. Staff time spent on supervision missions was efficiently used and relatively low (28 staff weeks) compared with other Bank-financed projects.

21. Although the project was rated satisfactory, it was found that this project did not have an adequate set of monitorable performance indicators. [2/] Fortunately, the

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[2/] ibid.

questionnaire prepared by the ICR preparation team and GOK's evaluation summary gave enough quantitative indicators to measure realistic outputs and impacts of the project. There was one implementation problem at the beginning of the project namely the exclusion of two eligible categories under the Schedule 6 of the Loan Agreement. The appropriate action was taken and corrections quickly made. The good working relationship between the Bank and the Borrower was not affected, and therefore there was no adverse effect on the development outcomes of the project.

F. BORROWER PERFORMANCE

22. Overall implementation of the Borrower performance was satisfactory despite the earlier difficulties stated above. The project implementation staff were found to be both dedicated and skilled. Furthermore, the PIU was supported by the efficient procurement services of SAROK. This organization has had a long history of successful equipment procurement for Bank-financed projects. Throughout the duration of the project, the only procurement-related issue that arose was when a two-stage procurement procedure was used by SAROK without the consent of the Bank. This problem was quickly addressed when it was discovered.

23. The Government provided adequate counterpart funds throughout the project years for the first two components. There was an initial shortage of budget for the library network system, however, a sufficient budget was provided after the third year by the Ministry of Education.

24. Covenant compliance was highly satisfactory. Submissions of audit reports were always on time. Equipment procurement was also generally satisfactory. ICB procedures were used for more than 95% of the equipment procurement. Reasonable prices were secured for highly specialized mainframe computers and other science centers equipment, and all contracts were awarded to the lowest evaluated bids. All equipment was delivered, installed and fully utilized. Training was given on time for administrative staff and technicians. They were no evidence of any maintenance problems, shortage of spare parts or lack of consumables.

G. ASSESSMENT OF OUTCOME

25. The project outcomes were rated highly satisfaction by the last supervision report. The science centers of the secondary schools have raised the quality of their graduates. Graduates from these centers were able to either find employment or continue their education programs through universities/colleges. Equipment has been well maintained and utilization rate has been high.

26. Joint science centers have been established in each of the colleges of natural science in the national universities. The joint usage of these centers has helped to raise the efficiency of O&M of the high-cost sophisticated equipment and the heavy demand for using these expensive equipment. The quality of university degrees in science

education has been raised, relevant to the rapidly changing technology demand of the workplaces.

H. FUTURE OPERATION

27. After Korea's graduation from the borrower status in June 1995, there was no expectation of any future Bank operations in Korea. However, due to the recent financial crisis in the East Asia Region, the Government has asked for some structural adjustment loans.

I. KEY LESSONS LEARNED

28. Given the complexity of the computer world and its ever changing technological development, sufficient project preparation time should be given to clearly understand the fundamental compatabilities of software languages, operating systems and equipment, and a range of supporting network systems.

PART II : STATISTICAL INFORMATION

Table 1: Summary of Assessments

A. Achievement of Objectives	Substantial (✓)	Partial (✓)	Negligible (✓)	Not applicable (✓)
Macro Policies	☐	☐	☐	☒
Sector Policies	☒	☐	☐	☐
Financial Objectives	☒	☐	☐	☐
Institutional Development	☐	☒	☐	☐
Physical Objectives	☒	☐	☐	☐
Poverty Reduction	☐	☐	☐	☒
Gender Issues	☐	☐	☐	☒
Other Social Objectives	☐	☐	☐	☒
Environmental Objectives	☐	☐	☐	☒
Public Sector Management	☐	☒	☐	☐
Other - Private Sector Development	☐	☐	☐	☒

B. Project Sustainability	Likely (✓)	Unlikely (✓)	Uncertain (✓)
	☒	☐	☐

(Continued)

C. Bank Performance	Highly satisfactory (✓)	Satisfactory (✓)	Deficient (✓)
Identification	☒	☐	☐
Preparation	☒	☐	☐
Appraisal	☒	☐	☐
Supervision	☐	☒	☐

D. Borrower Performance	Highly satisfactory (✓)	Satisfactory (✓)	Deficient (✓)
Preparation	☒	☐	☐
Implementation	☐	☒	☐
Covenant Compliance	☒	☐	☐
Operation (if applicable)	☒	☐	☐

E. Assessment of Outcome	Highly satisfactory (✓)	Satisfactory (✓)	Unsatisfactory (✓)	Highly unsatisfactory (✓)
	☒	☐	☐	☐

TABLE 2: Related Bank Loans/Credits

Loan/credit title	Purpose	Year of approval	Status
Preceding operations			
1. First Education (Cr. 151-KO)	Expansion of vocational high schools, junior technical colleges and teacher training	1969	Completed 09/76
2. Second Education (Ln. 906/Cr. 394-KO)	Improvements of vocational high schools, junior technical colleges and science, engineering and education colleges	1973	Completed 12/79
3. Third Education (Ln. 1096-KO)	Expansion and quality improvement in vocational high schools, junior colleges and vocational training institutes (VTIs)	1975	Completed 11/81
4. Vocational Training (Ln. 1474-KO)	Further expansion of VTIs and expansion and improvement of instructor training	1978	Completed 06/83
5. Sector Program on Higher Technical Education (Ln. 1800-KO)	Improving technical colleges and colleges of engineering and management through supply of equipment, staff development, manpower planning, equipment maintenance and academic accreditation	1980	Completed 02/86
6. Program for Science and Technology Education (Ln. 2427-KO)	Raising quality of science and technology education to standards required by a more skill- and knowledge-intensive industrial system through planned policy and institutional change	1984	Completed 06/89
7. Technology Advancement (Ln. 3037-KO)	Strengthening the development of SMIs in Technology-intensive sectors, improving the quality of education in a center of excellence in science and engineering education and enhancing the capacity of selected R&D institutions to provide technical support for SMIs.	1989	Completed 12/31/93
8. Second Technology Advancement (Ln. 3202-KO)	Improving the research capacity of one leading graduate school in science and engineering and enhancing R&D capacities in the areas of biotechnology, basic and industrial standards, and energy and	1990	Completed 06/30/94

	resource utilization		
9. Science and Technology Research (Ln. 3203-KO)	Enhancing basic research programs in selected universities in priority fields in science and technology and improving science teacher training	1990	Completed 12/31/95
10. Vocational Education (Ln. 3314-KO)	Upgrading the skill training provided in selected vocational high schools meeting the increasing complex skill requirements of industry, commerce, agriculture and fisheries	1991	Completed 06/30/96
11. Third Technology Advancement (Ln. 3315-KO)	Improving the quality of research programs for developing advanced technologies, increasing opportunity for joint basic science research activities through common research facilities; and enhancing the development and application of industrial standards	1991	Completed 06/30/94
12. Vocational Schools Development (Ln. 3469-KO)	Continuing with the objectives in Ln. 3314-KO to upgrade skill training in selected vocational high schools (VHS) and strengthening VHS system through five studies in five agreed areas	1992	Completed 12/31/97
Following operations			
13. Environmental Research and Education (Ln. 3612-KO)	Upgrading the capacity of selected agricultural and veterinary colleges to undertake research into key environmental problems, reinforcing the environmental aspects of basic science programs in the colleges and establishing appropriate arrangements for improving environmental research and training program	1993	To be completed 12/31/98
14. Science and Technical Education (Ln. 3693-KO)	Improving science and technical education and research through implementation of an agreed policies and actions program and the provision of specialized equipment	1994	To be completed 12/31/99
15. Environmental Technology Development (Ln. 3694-KO)	Strengthening: (a) selected national research institutes to identify and adequately address environmental issues and to undertake environmental R&D activities; and (b) the Ministry of Environment's policy and planning role	1994	To be completed 09/30/98

Table 3: Project Timetable

Steps in Project Cycle	Date Planned	Date Actual/ Latest Estimate
Identification (Executive Project Summary)	03/91	03/03-03/14/91
Preparation	07/91	07/21-08/10/91
Appraisal	11/11/91	11/10-11/27/91
Negotiations	01/92	03/16/92
Board Presentation	03/26/92	05/12/92
Signing	6/92	06/19/92
Effectiveness	09/92	09/09/92
Project Completion	06/30/97	12/31/97[1/]
Loan Closing	12/31/97	12/31/97
Last Disbursement	04/30/98	05/07/98
Cancellation of Remaining Funds	04/30/98	05/07/98

1/ Source: MOE submission dated February 13, 1998.

Table 4: Loan/Credit Disbursements: Cumulative, Estimated and Actual

(US$ million)

Cumulative Disbursements	FY93	FY94	FY95	FY96	FY97	FY98
Appraisal Estimate	4.0	14.0	32.0	45.0	49.0	50.0
Actual	0.0	04.0	17.1	33.5	46.8	48.8
Actual as % of Estimate	0%	8%	34%	67%	94%	98%

Date of Final Disbursement - May 7, 1998

Table 5: Key Indicators for Project Implementation

Key Implementation Indicators in the SAR/President's Report

		In 1992 estimated	By 1998 actual
(a)	Loan proceeds by components (in million) [1/]		
	Science Education Centers	$05.0	$05.0
	Undergraduate Science Education	$25.0	$23.7
	Library Network	$20.0	$20.0
	Total	$50.0	$ 48.8[2/]
(b)	Training		

1/ Expenditures on training are financed by the Government of Korea.

2/ Figures do not add up due to rounding.

Table 6: Key Indicators for Project Operation

Not Applicable

Note: Project Operation was satisfactory in past education projects in Korea. ***No operation indicators were considered necessary.***

Table 7: Training Included in Project

The library network system was designed to be user friendly, with only a little orientation necessary for students who would want to use the system. No student training was financed by the project. There was some training provided for administrative staff and laboratory technicians, but this training was provided, for the most part, by vendors of the equipment purchased for the system. The cost for this training was therefore factored into the overall contract costs. GOK's ICR submission did not include any detailed information on this subject.

Table 8A: Project Costs

	Appraisal Estimate (US$M)			Actual/Latest Estimate(US$M)/1		
Item	Local Costs	Foreign Costs	Total	Local Costs	Foreign Costs	Total
1. Equipment	-	58.1	58.1	-	56.9	56.9
2. Equipment transportation and installation	3.1	0.5	3.6	3.1	0.5	3.6
3. Operations and maintenance	8.9	0.9	9.8	8.9	0.9	9.8
4. Consumable materials	8.9	0.9	9.8	8.9	0.9	9.8
5. Training	0.3	0.1	0.4	0.3	0.1	0.4
6. TOTAL	21.2	60.5	81.7	21.2	59.3	80.5

/1 Partial information was provided by the Government submission, February 13, 1998.

Table 8B: Project Financing

	Appraisal Estimate (US$M)			Actual/Latest Estimate(US$M)/1		
Source	Local Costs	Foreign Costs	Total	Local Costs	Foreign Costs	Total
IBRD	-	50.0	50.0		48.8	48.8
Domestic Contribution	21.2	10.5	31.7	21.2	10.5	31.7
TOTAL	21.2	60.5	81.7	21.2	59.3	80.5

/1 Based on MOE's partial submission dated February 13, 1998.

Table 9: Economic Costs and Benefits

Not Applicable

Table 10: Status of Legal Covenants

Agreement	Section	Covenant type	Present status	Original fulfillment date	Revised fulfillment date	Description of covenant	Comments
Ln 3468-KO	3.03	5	C	Undated	NA	Develop practical science courses in the science education center and procure course-related equipment in accordance with Bank-approved guidelines	Fulfilled
	4.01	1	C	6/30 of each year		Furnish to the Bank audit reports including separate opinions on SOEs, not later than June 30 of each year	Fulfilled
	5.01	10	C			Manage project with adequate staff	Fulfilled

Notes: (a) Covenant type (only for those used in this table)

5 Management aspects
1 Accounts/audit
10 Implementation

(b) Status (only for those used in this table)

C Complied with

Table 11: Compliance with Operational Manual Statements

No evidence of non-compliance with applicable Bank manual statements observed.

Table 12: Bank Resources: Staff Inputs

Stage of Project Cycle	Planned		Revised		Actual	
	Weeks	US$(000)	Weeks	US$(000)	Weeks	US$(000)
Through Appraisal	-	-	-	-	16.4	48.7
Appraisal	-	-	-	-	3.8	11.6
Negotiations through Board approval	-	-	-	-	1.0	3.0
Supervision	-	-	14.9	70.0	26.2	96.5
Completion	-	-	4.5	19.3	2.6	7.7
TOTAL	-	-	-	-	50.0	167.5

Note: No or incomplete MIS or COS data for the planned or revised in staff-weeks and in dollars.

Table 13: Bank Resources: Missions

Stage of Project Cycle	Month/ Year	Number of Persons	Days in Field	Specialized Staff Skills Represented	Performance Rating		Types of Problems
					Implementation Status	Development Objectives	
Through Appraisal	03/03-03/14/91	2	11	Econ./Tech Educ.			
	07/21-08/10/91	6	60	Econ./Tech Educ./Impl. Spec./Sci. Educ./Info Sys.Spec			
Appraisal through Board approval	11/10-27/91 - 05/12/92	5	39	Econ./Tech. Educ./Impl. Sepc./Sci. Educ./Info Sys. Spec.			
Supervision	11-12/92	2	16	Tech. Educ./ Info Sys. Spec.	1	1	
	06-07/93	2	8	Tech. Educ.	1	1	
	10-11/93	2	8	Tech. Educ./ Info Sys Spec.	1	1	
	06-07/94	2	8	Tech. Educ.	HS	HS	
	11-12/94	3	22	Tech. Educ./ Info Sys. Spec.	HS	HS	
	06-07/95	2	6	Tech. Educ.	HS	HS	
	11-12/95	3	22	Tech. Educ./ Info Sys. Spec.	HS	HS	
	05-06/96	2	6	Tech. Educ.	HS	HS	
	10-11/96	3	22	Tech. Educ./ Info Sys. Spec.	HS	HS	
	09-10/97	3	3	Tech. Educ./ Ops. Off.	HS	HS	
Completion	09-10/97	3	13	Tech. Educ./ Ops. Off.	HS	HS	

Ratings: 1 - very satisfactory, 2 - satisfactory, HS - highly satisfactory

REPUBLIC OF KOREA
SCIENCE EDUCATION AND LIBRARIES COMPUTERIZATION PROJECT
(LOAN 3468-KO)

IBRD Progress Review Mission and Project Completion Mission
September 28 - October 18, 1997

Aide Memoire [1]

1. The IBRD mission[2] visited Korea from September 28, 1997 to October 18, 1997 to review the implementation progress of three World Bank financed projects under Loans 3468-KO, 3469-KO and 3694-KO, and also to reach agreements with the Ministry of Education (MOE) on preparing the Implementation Completion Report (ICR) for Loans 3468-KO and 3469-KO, of which the Closing Dates are December 31, 1997 for both projects. This Aide Memoire is for Loan 3468-KO only. There are separate Aide Memoires for the other two projects.

2. For Loan 3468-KO, the mission visited the Ministry of Finance and Economy (MOFE), MOE, the Supply Administration, Republic of Korea (SAROK), and two National Universities and two Joint Science Centers at Kwangju and Pusan, respectively. Their kind assistance, cooperation and hospitality is deeply appreciated.

Progress Review

3. **Procurement and Disbursements (Annex 1).** The current status of procurement and disbursements is generally satisfactory. Annex 1 summarizes the updated procurement and disbursements status for all four MOE projects still under implementation. Disbursements reached 95% of the total loan proceeds for the whole project - 93% for the University Science and Engineering Education and High School Science Components, and 97% for the Library Computerization Component. Procurement reached 94% of the loan.[3] The mission advised MOE to utilize the ***shopping procurement*** procedure, where appropriate, to reduce the procurement lead time (as compared to the use of the ICB procedure). The mission also advised MOE to make use of the ***direct payment to suppliers*** disbursement procedure instead of the other two, ***replenishment of the special account*** and ***special commitment***. The use of the ***special commitment procedure*** takes a much longer time and there may be less than adequate funds remaining in the special account due to the ongoing Bank recovery procedure which occurs during the last few months of the loan period. These procedures (***shopping procurement*** procedure and ***direct payment to supplier*** disbursement procedure) should be particularly useful if MOE is planning to fully disburse the $50 million loan proceeds. Also, at this final stage of project

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1 This aide memoire is subject to review and modification by Bank Management.

2 The mission comprised of Messrs./Ms. Robert L. McGough, Task Team Leader, Carol Ball, Operations Analyst, EASED, and Sing Zak Sung, Consultant.

3 This figure which is 1% lower than the 95% for disbursements is due to the remaining fund in the Special Account, counted for disbursements but not for procurement.

implementation, there should be some degree of fungability between funds in different categories in Schedule 1 of the Loan Agreement, as it would be undesirable to amend the Loan Agreement for minor deviations in Schedule 1 at a time near the Closing Date.

4. **Project Related Documentation.** The Special Account for this project is well managed. A sample review on the supporting vouchers for 25% of the line entries into the Statement of Expenditures (SOEs) during this review period (May to October, 1997) revealed no irregularities. A review of the bid evaluation reports at the Supply Administration, Republic of Korea (SAROK) for about 15% of the 133 contracts awarded during this review period also revealed no irregularities.

5. **Covenant Compliance.** All covenants are in full compliance, including the submission to the Bank of the audit report for Korea FY1996 together with a separate opinion on SOEs before June 30, 1997. The mission reminded MOE that the submission to the Bank of the audit report for Korea FY1997 together with a separate opinion on SOEs would be necessary before June 30, 1998 as there are eligible expenditures disbursements from this loan in 1997.

Project Completion and ICR[4] Preparation

6. **Project Closing Date.** The mission and MOE agreed that this loan will be closed on December 31, 1997 as stipulated in the Loan Agreement. Any unused balance of the loan proceeds would be canceled after the closing of the loan account. The Bank will inform the Ministry of Finance and Economy of the amount of cancellation. An extension of the Closing Date is unnecessary, given the timely and satisfactory implementation of all three components of the project (ref. Paragraph 3 above on the three components). There is no time overrun.

7. **Grace Period.** A four month grace period for disbursements of eligible expenditures after the Closing Date has been requested by MOE. The mission supports this request and will recommend that the Bank agree to the request. The mission explained that expenditures for goods and services delivered after the Closing Date could not be counted as eligible expenditures.

8. **Recovery of Funds in the Special Account.** The Special Account should have a zero balance after the full recovery of funds in the Special Account.

9. **Data Collection for ICR Preparation (Annex 2) and Time Schedule (Annex 3).** The mission and MOE reached agreement on the data to be collected from the participating universities in the Library Automation Network (LAN), participating universities in the Science and Engineering Education Component and the Joint Science Centers in the High School Science Component. Annex 2 gives the details. MOE has agreed to consolidate the information and pass it to the Bank. The agreed upon steps and timing are presented in Annex 3. MOE also agreed to send to the

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[4] ICR = Implementation Completion Report. The previous name was PCR, Project Completion Report. The Annex B "The Borrower's Evaluation Summary" now in the ICR replaces the Part II "Project Performance from the Borrower's Perspective" of the previous PCR.

Bank the following:

(i) Project cost table;
(ii) Project finance table;
(iii) Project components starting and completion dates;
(iv) Consolidated information for Loan 3468-KO;
(v) A new organizational chart for the management of the LAN and its terms-of-reference; and
(vi) A plan for future operations and future policies which may ensure project sustainability.

The time schedule for the preparation of the ICR is outlined in Annex 3.

Major Findings from Field Trips

10. **Science and Engineering Education Component ($25 million).** The participating colleges have been positively affected by this project. More than half of the equipment acquired by the colleges during the project's implementation period was purchased from loan proceeds. Research fields have been broadened and there is evidence of greater depth in the collection of data. Publications have increased. Professors' morale has been lifted. Student theses are considered to be of higher quality.

11. **Library Computerization Component ($20 million).** The national network has been completed. Cataloging in libraries has been computerized. Conversion of the software from Tandem to the Unix operating system has been completed and the Korean language software problems have been effectively addressed. The quantity and quality of the mainframe computers and PCs are now adequate. More than 5000 PCs have been installed at the Kwangju National University and more than 4400 PCs have been installed at Pusan National University. There have been no significant linkage problems. Professors and students are now using the system and the utilization rate is high. Management for the network has been moved from the SNU library to MOE. The mission supports this move as it is a more logical approach to the management of the network. The mission found no evidence of shortages in local funds to support the effective use and maintenance of the hardware and software. As a whole, this component also seems to have been quite successful.

12. **High School Science Component ($5 million).** The Joint Science Centers (JSCs) are functioning as planned. They are providing in-service training to high school science teachers; raising the science level of gifted high school students; providing general science education to the public through exhibitions; and the production of specific science teaching materials. The JSCs are well equipped, with about two thirds of their equipment being procured by loan proceeds. Laboratory management and utilization rates are satisfactory. All laboratories are individually provided with a laboratory assistant. The mission is also satisfied with the implementation of this component.

CC List

Name	Fax Number
Ministry of Finance and Economy Mr. Han, Hoon Deputy Director, Treasury Division Treasury Bureau	82-2-503-9282
Ministry of Education Mr. Chang, Oh-Hyun Assistant Minister for Higher Education Higher Education Office	82-2-730-6068
Mr. Hwang, Ji-Hyun Director Higher Education Facilities Division Higher Education Office	82-2-730-6068
Dr. Lee, Won-Joon Deputy Director Education Information Management Bureau	82-2-739-0690
Supply Administration, Republic of Korea Mr. Lee, Seong-Sil Assistant Director Foreign Procurement Division II	82-2-533-0711

KOREA
Procurement and Disbursement Status in Loan Projects of MOE
(October 1997)

Loan No.		Loan Amount (US$ millions) (A)	Procurement (US$ millions) Requests Sent to OSROK	To Be Sent	Contracts Awarded (B)	Percent of Loan (B/A)	Disbursements (US$ millions) Deposited Into Special Accounts	Percent of Loan	Remarks
3468-KO		50.0			47.2	94%	47.4	95%	Expected to be nearly fully disbursed.
	(a) for Basic Science Development	30.0	32.3	0	27.9	93%			
	(b) for Library Computerization	20.0	20.3	0	19.3	97%			
3469-KO		30.0	29.2	0	29.2	97%	28.8	96%	Expected to have a small amount of loan proceeds ($0.6 million) to be cancelled.
3612-KO /1		60.0					33.2	55%	Improved from 42% of last report.
	(a) Colleges of Agri.	34.7					17.2	50%	
	(b) Colleges of Vet.	13.0					7.3	56%	
	(c) NICEM	12.3					8.7	71%	
3693-KO /1		190.0	158.5	31.5	108.4	57%	104.7	55%	About 4% better than last report.
	(a) for MOE	170.0	140.8	29.2	92.6	54%	91.5	54%	
	(b) for KBSI /2	20.0	17.7	2.3	15.8	79%	13.4	67%	

Source: Latest Status Report

/1 These two projects were not included as projects to be reviewed by this mission, but the disbursement figures were updated.

/2 This portion is not under MOE

Annex 1

Annex 2

REPUBLIC OF KOREA

SCIENCE EDUCATION AND LIBRARIES COMPUTERIZATION PROJECT (Loan 3468-KO)

Questionnaire For The Preparation Of ICR

I. Library Computerization Component ($20 million)

A. Quantitative Achievements

1. (i) How many universities covered by the Loan?
   (ii) What is the total number of universities in Republic of Korea?
   (iii) What is the percentage of the Loan's coverage?

2. (i) How many mainframes and workstation level computers purchased and their costs during the project years, and the percentage of the Loan's financing?
   (ii) How many pieces of other hardware excluding mainframes and personal computers (PCs) purchased and their costs during the project years, and the percentage of the Loan's financing?

3. (i) How many PCs purchased and their costs during the project years, and the percentage of the Loan's financing?
   (ii) What is the average number of personal computers for each participating university?

4. (i) Any expenditure on civil works for housing the equipment?
   (ii) If yes, what is the total cost?
   (iii) By whom? By MOE or by the universities?

5. (i) How many private universities included in the network?
   (ii) What is the total number of universities included in the network?
   (iii) What is the private universities' percentage included in the network?

6. (i) How many universities already linked?
   (ii) What is its link percentage?

7. (i) What are the rates of network established by level of network? i.e. by level of library, by level of campus, and by level of internet?

B. Utilization Indicators

1. How many number of PCs in use for general purpose and for official use?

2. (i) How many expected users?
(ii) How many users per PC? By teaching staff, by students, and by administrative staff?

3. Please give comments on adequacy and future plan.

C. Performance Indicators

1. Is the computerization conversion of the library catalog system completed?

2. (i) If not, what is the conversion percentage? i.e. number of completed universities versus the total number of universities in the network.
(ii) When will the conversion complete and finance by whom?

3. (i) What is the status of the functioning module, i.e. searching, cataloging, periodicals, etc.? software in the computing system of university libraries.

4. Is the Korean language software working well?

Note: For A, B, and C above, it is not necessary to give names of universities. We need to know the success and failure, if any, of the component. Any comments of the above are welcomed.

D. Management

(i) Is the present management arrangement (by a Committee located at Advanced Academic Information Center) functioning adequately for the network?
(ii) Please submit an organization chart and its terms-of-reference.

E. Finance (related to A above)

(i) Is the hardware budget adequate? Both mainframes and PCs?
(ii) Is the software budget adequate?
(iii) Is the recurrent budget adequate?

Note: D and E are questions concerning sustainability.

II. University Science Education Component ($25 million)

A. Quantitative Achievements

The following table may show the achivements at a glance:

Allocation of Loan Proceeds (US$ million)				
	Actual Defrayment	MOE Allocation	SAR Allocation	Remarks
Science				
Total				

(i) What is the percentage of Bank-financed equipment as compared to the total amount of equipment purchased, regardless of financing sources, within the same time period.

(ii) How many topics of research work were carried out (even partially) with the equipment added by the project?

(iii) What percentage is that in terms of the total number of research topics done in the universities concerned during the same time period.

B. Output Indicators

Enrollment of students	1993	1997	Rates of Increase
(i) No. of new entrants (ii) No. of graduates (iii) No. of employed graduates (iv) No of graduates advanced to graduate courses			
Teaching Staff			
(i) No. of students per professor (ii) No. of professor with doctor's degree (iii) Workload of professors (iv) Research articles published			
Equipment			
(i) Type of provided equipment (ii) No. of units (iii) Total costs			

III. Joint Science Centers (S5 million)

A. Quantitative Achievements

Joint Science Centers	High School Students		Experiments			
No. of Joint Science Centers (JSCs) in Korea equipped from the Loan	No. of high school students served	Total number of high school students in Korea	No. of experiments that were carried out by JSCs	Total number of experiments required in the high school science curricula	Rate	Remarks

B. Utilization Indicators

No. of operating hours possible in a JSC per week	No. of hours (on average) in actual operation per week	Utilization Rate	Remarks

C. Management & Finance (regarding A above)

Item	Opinion	Plan for rectifying the problems
(i) Degree of cooperation between user high school and JSC		
(ii) Any staff shortage		
(iii) Any lab-technician shortage		
(iv) Any shortage on consumables		
(v) Any repair and maintenance problems		
(vi) Any recurrent budget shortage		

KOREA
Loan 3468-KO
ICR Preparation Table

Bank Side		MOE Side	
Step Name	**Date**	**Step Name**	**Date**
(a) Time Schedule - Steps and Dates			
Project Completion Mission	Held already in Sept./Oct.97	Data Collection	10/18/97 - 12/18/97
		Documents & Tables to reach Bank	by 01/30/98
ICR Drafting	01/30/98 - 03/05/98	Preparation of Evaluation Summary	10/18/97 - 03/05/98
		Evaluation Summary to reach Bank	03/16/98
Draft ICR to MOE	03/20/98	Comments on Draft ICR	03/31/98 - 04/30/98
Gray Cover ICR Preparation	03/20/98 - 05/15/98		
ICR to Bank's Board	06/30/98		

(b) List of Documents and Tables to be sent to the Bank from MOE

(i) The Evaluation Summary to be annexed to the ICR	(see steps 3 and 4)
(ii) Documents and Tables: Project cost table Project finance table Project components starting and completion date tables Consolidated information for Ln. 3468-KO (reference: Annex 2 in Aide Memoire dated October 1997) Plan for future operation, as evidence of sustainability	(see steps 1 and 2)
(iii) Comments on draft ICR	(see step 5)

(c) The Documents to be sent by Bank to MOE

(i) Draft ICR	(see Bank side step 3)
(ii) Final ICR (after Bank's Board approval)	(see Bank side step 5)

ANNEX B

MINISTRY OF EDUCATION
SEOUL 110-760, REPUBLIC OF KOREA
TEL: (2)-720-4979, fax; (2)-730-6068

February 13, 1998

Mr. Robert L. McGough
Senior Technical Educator,
Education Sector Unit
East Asia and Pacific Region
The World Bank
Washington, D.C., U. S. A.

Dear Mr. McGough,

Subject: Evaluation Summary on the Project Performance of the IBRD Loan, No. 3468-KO

The captioned Evaluation Summary is forwarded enclosed herewith to the Bank.

Best regards,

Yours very truly,

Hwang, Ji-Hyun
Director,
Higher Education Facilities Bureau
Higher Education Office

Encl: Evaluation Summary 1.

Summary of Evaluation on the Project Performance of the IBRD Loan, No. 3468-KO

February 13, 1998

Ministry of Education
Republic of Korea

Evaluation Summary
on the Science Education and University Libraries Computerization Project,
IBRD Loan No. 3468-KO

The purpose of the Project was to upgrade quality of the science education in the colleges of natural sciences in the national universities, secondary schools, and develop computer network and exchange of information among university libraries, especially among national university libraries.

The relevant Loan Agreement was signed on June 19, 1992 and the Project was completed. on December 31, 1997. For evaluation of the purposes achieved in the Project, the Ministry of Education, and the World Bank mission visiting Korea in October 1997 for preparing ICR of the Project, agreed to evaluate performance of the Project through visits to project institutions and correspondence questionnaires with them.

The evaluation was aimed at presenting figures for an objective evaluation to the possible extent, and information of the completed project was collected around November '97 in the Ministry mainly from project institutions according to the forms agreed upon with the above mission.

In the project part for computerization of university libraries, the purposes of the project seemed to be achieved through providing the related equipment and establishing a substantial network among national university libraries. In the project part for upgrading quality of basic science education of undergraduate courses and the local science education centers established for providing in-service training to secondary science teachers, the general trend, also, seemed to be successful though the evaluation could not be presented with substantial figures.

1. Introduction of the loan

The loan application of the Ministry was officially presented to the World Bank through Ministry of Finance and Economy together with other loan applications of the government in package in November 1990.

The Bank's mission visited Korea twice, during July to August and in November 1991, made identification and evaluation of the applied project, and recommended the loan to the board of the World Bank.

The Loan Agreement of US$ 50 million equivalent was signed on June 19, 1992 and its effectiveness was notified to the Government from the Bank on September 9, 1992. In March 1993, the MOE Special Account, the operational fund of the project, was opened with the Korea Exchange Bank and conditions were made ready for the Project to be implemented.

The project fund of the loan by project part was as follows:

(a) Science Education Centers for the secondary science education (15 centers): US$ 5 million.
(b) Undergraduate science education (18 universities): US$ 25 million.
(c) University libraries computerization (45 institutions): US$ 20 million.

The local fund for the Project was estimated to be about US$21.2 million equivalent for local land transportation, installation, operation and maintenance, and consumables for the equipment to be procured by the loan.

2. Selection of the participating institutions in the Project

The project was originally designed and introduced on the basis of the performed results of the previous similar project, The Science and Technical Education Project, completed about ten years before from the Bank loan, No. 2427-KO for a further development of the same field. Selection of the participating universities, therefore, was rather simple for the project part of the undergraduate science courses. Designing of the project for this part was aimed at upgrading quality of the basic sciences education in national and public universities.

The selected were 18 national universities with colleges of natural sciences, and 15 locally positioned science education centers. The latter were so selected as their establishment was particularly aimed at providing in-service training to the secondary science teachers and developing and distributing specific instructional materials. In the secondary science education, upgrading quality of the science teachers was considered to be one of the most effective factor in strengthening the basis of science education.

For the project part of the university libraries computerization, the selected to directly participate in the project were 45 institutions, i. e. national universities expected to work as the central center and as local centers for the library network, other various national institutions including those of teacher-training and the Korea Education Development Institute.

3. Procurement of the Experimental and Laboratory Equipment

In the Ministry, the item lists of basic equipment for procurement from the loan were collected at the time of loan application from universities for their evaluation and allocation of the loan. These lists were also reviewed by the Bank mission when they identified and evaluated the applied project loan.

Therefore, the participating institutions began to program procurement schedules, at the beginning of the project implementation, made adjustments to the equipment lists and the related specifications according to changes made in curricula, educational contents, and models on the suppliers' side, and requests for procurement were made to Supply Administration, Republic of Korea (SAROK).

In SAROK, technical review of the procurement requests, advertisement for international competitive bidding, and contract awarding were made taking about 70 days in total. The contract items of equipment were supplied to the related educational sites through maritime or air-borne transportation according to types of the equipment and conditions of the contract, taking about 50 days at the most when the longest maritime forwarding was made. The equipment supplied to the designated sites was installed or placed, and strict operational tests were made according to their types and usage. Users of the equipment were trained according to the type of equipment, and technicians were trained on high-cost sophisticated equipment.

3-1 Implementation of the Project was as follows:

3-1-1 (Part A) Processing for procurement of the experimental and laboratory equipment for the 15 science education centers was made by the related supervising Office of Education in the municipal provinces and cities under their responsibility. As their related staff experienced several times in the similar job in previous loan projects for supplying similar equipment to their vocational high schools, there was almost no problems reported, and the project was carried out as originally planned without any overrun in the project period and the project fund. Laboratory work conducted in the Centers using equipment provided under the loan were reported as follows:

<Laboratory Work in the Science Education Centers>

Science Education Centers (SEC)	High School Students		Laboratory work		
SECs supplied wth equip' t	Students used loan equip' t *	Total high school students	Number of experiments	Total experiments defined in curricula	Percentage
15	243,948	1,892	136	168	81%

Note: * Figures in column "Students used loan equip' t" are man-days.

3-1-2 (Part B) Procurement of the loan equipment for upgrading quality of science education in the colleges of natural sciences in the 18 national universities was processed by the universities' staff under their responsibility. The staff working on procurement of educational equipment had experienced in the similar work under the two previous World Bank projects, Loan Nos. 1800-KO and 2427-KO. Therefore, there was no problems reported in processing all the related procurement, and their part of the project also was completed without any overrun in the project period and the project fund. The quantitative figures of the equipment procured for this part of the project were as follows:

<Procurement of Equipment for Experimental and Practice Training>

Project institutions	Project equip' t procured			Initial allocation
	Types	Units	Amount	
18 universities	1,846	3,674	US$ 23,668,497	US$ 25,000,000

3-1-3 (Part C) Outline of this part of the project was to: (a) establish an inter-library network through, inter alia, the provision of 11 mainframe computers to link the libraries of the main center at Seoul National University to the Korean Educational Development Institute and to the nine local university library centers; (b) provide computer systems for inter-library network participation and local library automation in 15 universities and 11 teachers' colleges within the inter-library network; and (c) provide training for library staff in computer skills and technology for the purpose of operating the inter-library network.

Before the Project, some universities of the project, including Seoul National, had begun to computerize their libraries and developed computerizing programs. Therefore, in the beginning stage of the project, they needed some period for adjustment and coordination in the contents and schedule of the plan for the national setup of computerization and network among universities of the project. The project itself including procurement of the related equipment was delayed for some time.

The overall responsibility for establishing the national computerization and network among the university libraries lay with the Committee for University Library Automation (CULA), which consisted of the directors of the ten university libraries who were on two-year appointments. Operating under the direction of the CULA was the Working Group for University Library Automation which comprised the ten chief librarians of the project universities, and special subcommittees for handling major technical issues.

The CULA responsible on implementing the project was rather excessively emphasized with their professionalism, and their administrative and coordinative aspect was somewhat neglected among the nation-wide local centers and universities. In one or two universities of the project, students and professors had to wait for some time to use their computerized system of the high-cost equipment due to shortage of library terminals.

In the third year of the Project (1996), there was a reorganization of the Ministry, and Bureau of Educational Information Management was established. Implementation of this part of the project was transferred to the Ministry, and the delayed implementation was recovered as scheduled in the plan under improved budgetary conditions.

The university libraries computerization part of the project, successfully completed, would be very much contributive to the industrial fields as well as to the fields of education and researches, accompanied by the fast expanding programs of the internet, in the rapidly developing and changing informational age. Professional libraries in colleges of various fields also would be utilized more smoothly among themselves. The performed status of the computerized network among the Project institutions was as follows:

<Implementation Status of the Library Computerization>

Total univs	Project univs	Main frames & workstation level PCs		General PCs		Network status
		Total PCs	Loan fund %	Total PCs	Loan fund %	
184	44	57	45%	1,515	15%	Libraries : 90% Campus : 70% Internet : 64%

4. Use Status of the Equipment Procured from the Loan

4-1 Project part of the Science Education Centers

The Science Education Centers had been established for improving education of the fast-developing scientific knowledges to: (a) provide in-service training to the secondary science teachers; (b) develop, produce, and distribute specific educational materials, etc. for use of the secondary schools.

Therefore, the equipment supplied to these centers were different in using times and in users, to some extent. The equipment provided to these centers were used, in the case for giving in-service training to science teachers, during summer and winter vacations. The science teachers had been trained most regularly in the changed contents of the science curricula adjusted every five years. They were dispatched to the centers in turn and trained for weeks staying there together.

Some items of equipment supplied to the centers were installed for demonstrational show or display in a hall for effective cultivation of scientific knowledge for the elementary and the secondary students and the general public.

<Operation of the Science Education Centers>

Available hrs per week	Actual hrs per week	Use rate
30hrs(6days×5hrs)	24hrs(6days×4hrs)	80%

4-2 Use status of the equipment provided from the loan

The universities participating in the project had prepared the equipment lists for the project when they applied for the project, and the specifications were also prepared during the preparation stage of the project before signing on the loan. As the related staff of the participating universities had experiences on the similar work of the Science and Technology Education Project, Loan No. 2427-KO with US$75 million for '84 to 88, there was no problems reported on implementation of the project, and no overrun in the fund and the period of the project.

Regarding use of the equipment provided in the project, their utilization rate appeared to be high according to logbooks in laboratories of the project universities, and research papers published in the academic periodicals, international as well as local, using the provided equipment in the project were in the increasing trends during and

after the project. The research plans carried out during the project period using the equipment supplied in the project were 3,508 in total number and their rate occupying in the total researches including that conducted from other fund sources reached 42.1 %. Project indicators of students and professors during the project period are as follows:

<Project Indicators of Students and Professors>

	1993	1997	Increase rate(%)
Students			
(i) Entrants	7,693	8,032	4.4
(ii) Graduates	6,053	6,374	5.3
(iii) Employed	2,323	2,753	18.5
(iv) Those advanced to grad schs	833	1,204	44.5
Teaching staff			
(i) Students per professor	25.0	22.3	△10.8
(ii) Percent of doctorate holders	88.5	93.4	5.5
(iii) Work load	12.5	13.3	6.4
(iv) Papers published	3,217	3,586	11.4

Special remarks to be made in connection with this project is that a central joint use laboratory building had been established in each of the colleges of natural sciences in the national universities. This new system considerably helped raising efficiency of the operation and maintenance of the high-cost sophisticated equipment and their contribution would be substantial to meeting the heavy load of the high-costs of laboratory equipment increasing rapidly these days.

1-3 Use of the completed university library computerization part of the project

The computerized network had been established among the university libraries, and students, teaching staff, and administrative staff also were making full use of it. In the Project institutions, their utilization indicators were as follows:

<Use of the Terminal PCs>

Unit; person

Total PCs	Users per PC	Professors per PC	Students per PC	Admin staff per PC
24,918 PCs for general use 37,379 PCs for office use	10	0.7	22	0.5

5. Benefit of the Project

The project was designed and formulated on the base of the achievement from the preceding loan in the same field, loan No. 2427-KO, the Science and Technical Education Project. As the results of the project, R & D activities for the industrial technology would be reinforced. For the while, industries had made large advances in technical development, especially in the information-oriented trends, and the university library computerization project was planned to cope with the new stream. The results of the project seemed to be producing its effect and benefits in the related industrial and social fields. As shown in the above tables, the individual's scope of intellectual activities appeared to be expanding rapidly, and the results of the project was not only meeting globalization of the industrial fields as well as almost every field of activities in Korea, but also they were expected to lead such fields in future.

As we see in the trace of economic development in Korea in the latest four decades, Koreans, without much natural resources, had to rely on the development of technical manpower and maximize their productivity and increase the value of the imported raw or processed materials and get the margin of the related export out of them for Korea's development. Looking forward in the near future when the national boundary will be diminishing rapidly in the economic activities, and the world changing to be more and more knowledge intensive and information-oriented one society, the Project is expected to benefit the future development of Korea.